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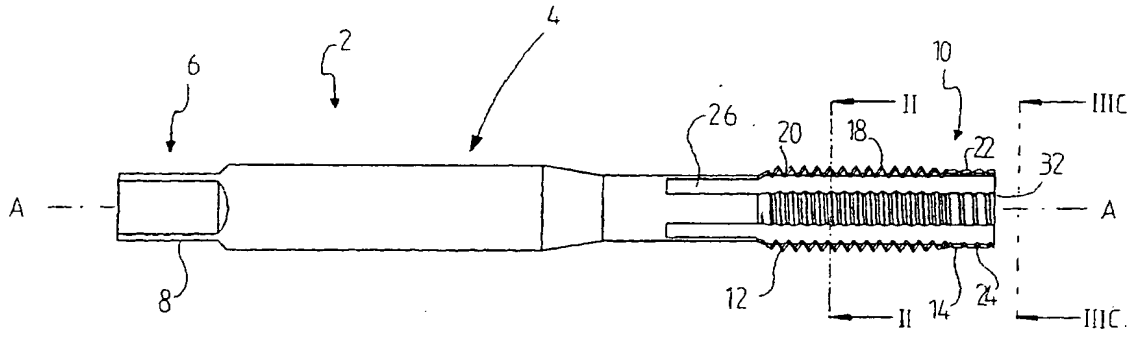
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A THREAD FORMING TAP WITH A NON-CIRCULAR CROSS-SECTION AND RADIALLY EXTENDING CUTTING EDGES



(57) Abstract: A thread forming tap comprises an elongated body (4), having at a first end (6) a connector portion (8) and at a second end (10) a thread forming portion (12), said thread forming portion comprising at least one thread forming thread (18) having a non-circular cross-section including at least three lobes (30) for plastically deforming an interior wall of an opening while forming an internal thread. According to the invention, at the open end (32) of the elongated body (4), at least one radially extending edge (34) is provided for cutting parts of the interior wall of said opening.

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A thread forming tap with a non-circular cross-section and radially extending cutting edges

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a thread forming tap comprising an elongated body, having at a first end a connector portion and at a second end a thread forming portion, said thread forming portion comprising at least one thread forming thread having a non-circular cross-section including at least three lobes for plastically deforming an interior wall of an opening while forming an internal thread.

TECHNICAL BACKGROUND

Such a thread forming tap is known from EP-A-0 767 024. That kind of tap is however disadvantageous, as it can barely be used for other openings than circular cylindrical holes.

SUMMARY OF THE INVENTION

The object of the invention is to achieve an improved thread forming tap.

This has been achieved by the tap of the initially defined kind, wherein at the open end of the elongated body, at least one radially extending edge is provided for cutting parts of the interior wall of said opening.

Hereby is achieved a thread forming tap that pre-forms an opening to a form suitable for thread forming, which in turn extends the working life of the tap, since better thread forming conditions are achieved.

Preferably, said edge extends substantially from the central axis of said elongated body. Hereby, efficient forming of e.g. conical blind holes is achieved.

Suitably, a thread relief portion is provided between said thread forming portion and said open end, said relief portion being provided with a thread having a cut ridge having a substantially circular cylindrical form and being divided by a helical groove for allowing turning the tap away from said opening. Hereby, easy removal of the tap after thread forming is allowed.

Preferably, said cut ridge has a diameter smaller than the largest diameter of the thread forming thread, and wherein said groove has a diameter slightly smaller than the diameter of the cut ridge.

Advantageously, the diameter of the thread of the thread forming portion increases from the level of the cut ridges of the relief portion. Hereby, thread forming is made possible.

Suitably, at least one flank portion extending substantially radially from the axis of the body defines a flute extending substantially in a longitudinal direction of the body and through said thread forming portion, said thread forming thread thereby being cut into a discontinuous thread. Hereby chip removal and supply of cooling fluid supply is allowed.

In particular, said flute is substantially straight. Alternatively said flute is helically shaped about the circumference of said body.

DRAWING SUMMARY

In the following, the invention will be described in more detail by reference to the accompanying drawings, in which

Figure 1 illustrates a thread forming tap,

Figure 2 is a cross-section along the line II-II in figure 1

Figure 3a is a perspective view of the tap shown in figure 1,

Figure 3b is an enlargement of the portion within the circle shown in figure 3a,

Figure 3c is a front view of the tap shown in figure 1,

Figure 4 illustrates an alternative thread forming tap.

DETAILED DESCRIPTION

Figure 1 shows a thread forming tap 2, comprising an elongated body 4 having an axis A-A. The elongated body 4 has at a first end 6, a connector portion 8 and at a second end 10 a thread forming portion 12, and a thread relief portion 14. The tap 2 is preferably made of a high speed steel or a solid carbide material. The connector portion 8 is adapted to be connected to a tool holder of a drilling or milling machine.

The thread forming portion has a thread forming thread comprising a ridge 18 separated by a helical groove 20. The diameter of the thread 18 increases from the relief portion 14 towards the second end 8 and after a few pitches, the diameter is constant (however not circular, see below).

The thread relief portion 14 is provided with a helical thread having a cut ridge 22 separated by a helical groove 24. The cut ridge 22 has a smaller diameter than the largest diameter of the thread forming thread 18 and the groove 24 has a diameter slightly smaller than the diameter of the cut ridge 22. The pitch of the thread 22 and the groove 24 of the thread relief portion 14 is the same as in the thread forming portion 12. The thread forming portion allows for turning the tap away from said opening after performed thread forming operation.

The threads 18 and 22 are separated in the longitudinal direction of the body 4 by four flutes 26 (see also figure 2). The flutes 26 are thus defined by four flank portions 28. At the periphery of each flank portion 28, the thread 18 and 22 is arranged,

respectively (in figure 2, only the flank portions of the thread forming portion 12 can be seen). The purpose of the flutes 26 is to allow supply of a cooling fluid and to allow removal of chips.

The four flutes 26 divides the thread 18 into pieces of a thread, the pieces of thread thus forming a discontinuous or virtual thread. The same relates to the thread 22.

The thread 18 of the thread relief portion is non-circular (see figure 2). Instead, each flank is provided with a pointed thread part, each forming a lobe 30 for plastically deforming the interior wall of a hole while forming an internal thread.

As can be better seen in figure 3a – 3c, the first end 10 is provided at its open end 32 with four radially extending cutting edges 34 for cutting non-circular cylindrical holes. Cast blind holes are generally not circular cylindrical, but may be slightly conical due to the casting process. The cutting edges 34 are thus utilised for forming the non-circular cylindrical holes to a circular cylindrical shape.

In figure 4, an alternative tap 4 is shown, the difference being that the flute 26 is somewhat helical, rather than straight.

OPERATION

A thread is to be formed in a through hole or a blind hole of a non-circular cylindrical – in particular irregular - shape, respectively, e.g. in a moulded piece of metal.

The tap 2 is moved to the hole defined by a wall (not shown). During its introduction into the hole, the tap is turned and the cutting edges 34 cut the hole and form it to the predetermined circular cylindrical shape. The groove 18 enters the hole and the lobes 30 press the material of the wall at such a high pressure that it is plastically deformed and floates into the groove 20. A cooling fluid is introduced via the flutes 26.

When the thread forming operation is finished, the tap is turned in the opposite direction. The thread relief portion 14 facilitates withdrawal of the tap from the hole.

Of course, the number of flanks 28 and flutes 26 may be less than four, e.g. three, and more than four, e.g. eight.

Furthermore, the flanks 28 and flutes 26 may be helically shaped.

Furthermore, the number of threads may be more than one, i.e. a pair of parallel threads may be provided.

Furthermore, in figure 1, the shape of the thread relief portion is illustrated as circular cylindrical. However, it may instead be slightly conical, the largest part of the cone being at the open end 32 of the body 4.

Furthermore, the number of cutting edges may be less than four, e.g. one, or more than four, e.g. ten. However, it is advantageous to arrange the same number of cutting edges as the number of flanks.

CLAIMS

1. A thread forming tap comprising an elongated body (4), having at a first end (6) a connector portion (8) and at a second end (10) a thread forming portion (12), said thread forming portion comprising at least one thread forming thread (18) having a non-circular cross-section including at least three lobes (30) for plastically deforming an interior wall of an opening while forming an internal thread, **characterised in that** at the open end (32) of the elongated body (4), at least one radially extending edge (34) is provided for cutting parts of the interior wall of said opening.

2. A thread forming tap according to claim 1, wherein said edge (34) extends substantially from the central axis (A-A) of said elongated body (4).

3. A thread forming tap according to claim 1 or 2, wherein a thread relief portion (14) is provided between said thread forming portion (12) and said open end (32), said relief portion (14) being provided with a thread (22) having a cut ridge having a substantially circular cylindrical form and being divided by a helical groove (24) for allowing turning the tap away from said opening.

4. A thread forming tap according to claim 3, wherein said cut ridge (22) has a diameter smaller than the largest diameter of the thread forming thread (18), and wherein said groove (24) has a diameter slightly smaller than the diameter of the cut ridge (22).

5. A thread forming tap according to claim 4, wherein the diameter of the thread (18) of the thread forming portion (12) increases from the level of the cut ridge of the relief portion.

6. A thread forming tap according to anyone of the preceding claims, wherein at least one flank portion (28) extending substantially radially from the axis (A-A) of the body (4) defines a flute (26) extending substantially in a longitudinal direction of the body and through said thread forming portion (12), said thread forming thread (18) thereby being cut into a discontinuous thread.

7. A thread forming tap according to claim 6, wherein said flute (26) is substantially straight.

8. A thread forming tap according to claim 6, wherein said flute (26) is helically shaped about the circumference of said body (4).

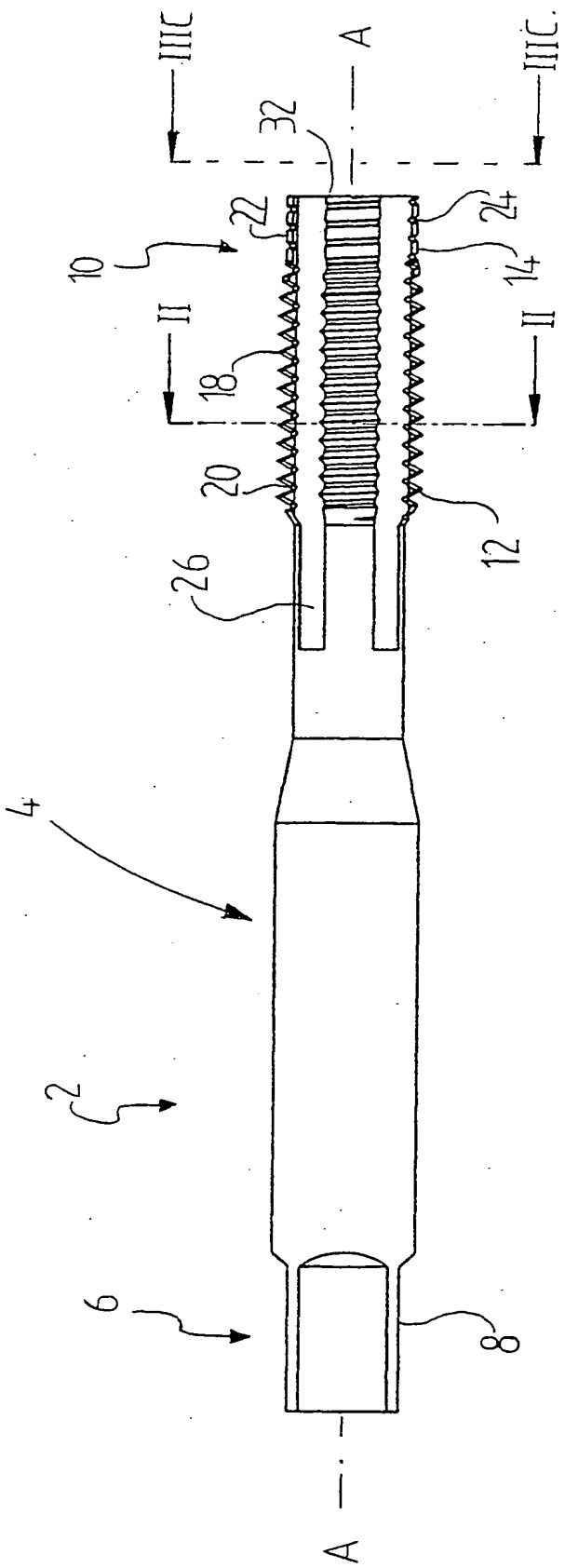

Fig 1

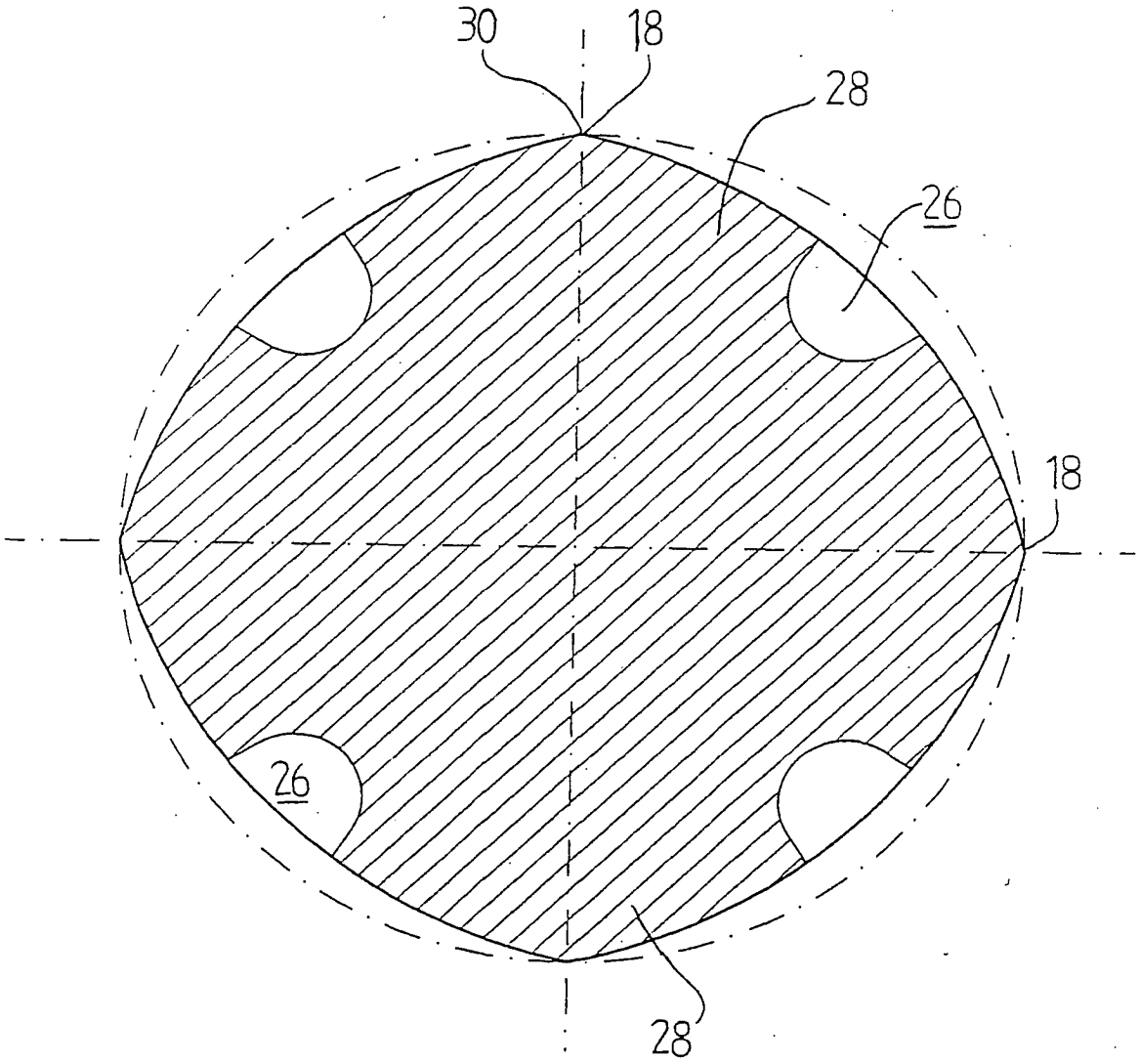

Fig 2

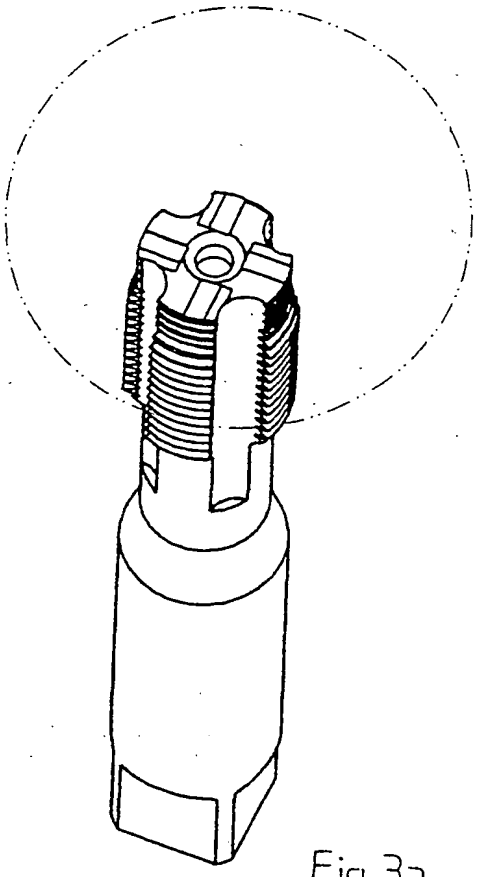

Fig 3a

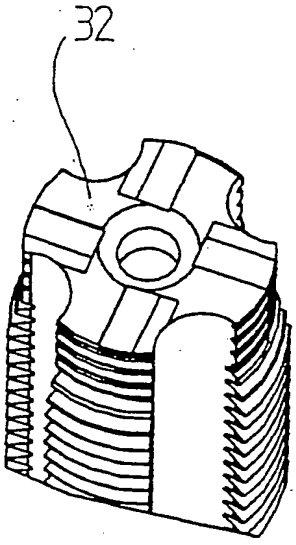

Fig 3b

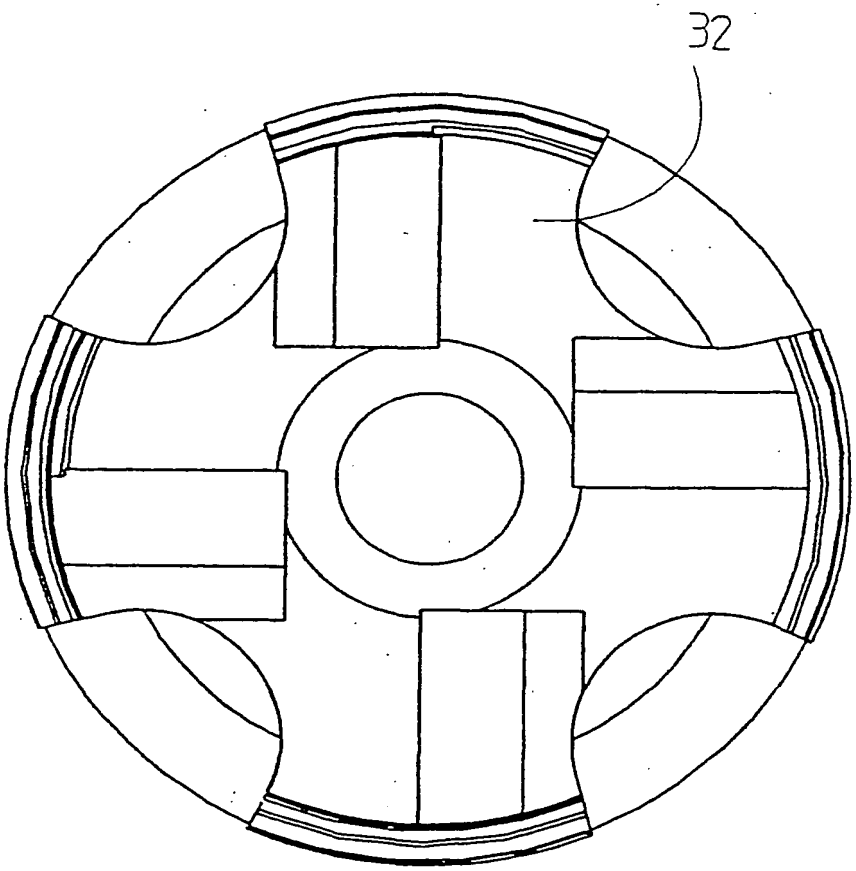

Fig 3c

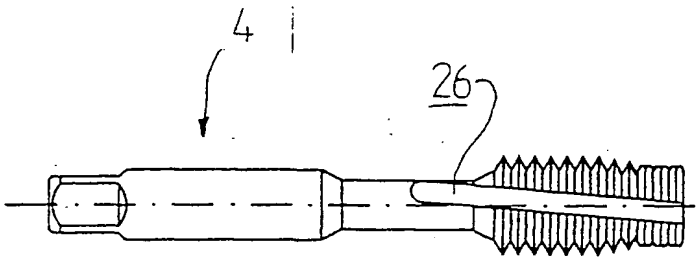

Fig 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 02/00980

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B23G 1/16, B23G 5/06, B23G 7/02
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI-DATA, EPO-INTERNAL, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 5562371 A (GARY J REED), 8 October 1996 (08.10.96), abstract	1-8

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search	Date of mailing of the international search report
15 August 2002	02-09-2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Åsa Lööf/EK Telephone No. +46 8 782 25 00

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International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

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International application No.
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